

STUDIES IN THE GENUS COCCOLOBA, IX.
A CRITIQUE ON THE SOUTH AMERICAN SPECIES *

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Coccoloba oblonga Lindau, Bot. Jahrb. 13: 136. 1890.

This species was based on *Riedel 614* made near Ilheos, Bahia, Brazil. Lindau cited only the Leningrad specimen, although there is a large specimen in the Berlin herbarium. The species has been referred to the synonymy of *Coccoloba cruegeri* Lindau (q.v.). Lindau placed *C. cruegeri* in the section *Campderia* and *C. oblonga* in the section *Eucoccoloba*. I have indicated previously (Jour. Arnold Arb. 40: 74. 1959) that there is no evidence that *C. cruegeri* belongs in *Campderia*.

Coccoloba obovata HBK. Nov. Gen. 2: 141. 1817; Howard, Jour. Arnold Arb. 40: 209. 1959.

Coccoloba coriacea Willdenow ex Lindau, Bot. Jahrb. 13: 194. 1890, not Sagra.

Coccoloba goudotiana Weddell, Ann. Sci. Nat. III. 13: 260. 1850.

Coccoloba obovata was based on a Humboldt specimen collected in flower in June, 1805, at Honda, Colombia. A fine specimen in the Paris herbarium bears the most complete label and has been designated as the lectotype. *Coccoloba coriacea*, attributed to Willdenow, was published in synonymy by Lindau. The type of *C. goudotiana* (*Goudot s.n.* from San Luis, Colombia) is deposited in the Paris herbarium. It is clearly the same as *C. obovata*.

Most of the specimens seen have darkened in drying, the upper surface considerably darker than the lower leaf surface. In sterile condition this species is difficult to distinguish from comparable material of *Coccoloba coronata*, especially when it is represented by material from adventitious shoots. In general the ocreae of *C. coronata* are lighter in color and the petioles are shorter and stouter.

The species, with additional synonyms, is also known from Costa Rica and Panama.

Colombia. ANTIOQUIA: Medellín, *Toro 641* (NY); without specific location *Triana 981* (B). MAGDALENA: Cartagena, *Goudot s.n.* (P); San Andrés de la Sierra, *Pittier 1694* (GH). SANTA MARTA: Guamacito, *Record 34* (A, F, NY), *Espina 32* (F); Masinga, *Smith 421* (A, F, G, GH, NY, P), *422* (A, BR, P); Minca, *Espina & Giacometto A10* (F); Valparaíso, *Smith 1702*, in part (A, F, G, GH, NY, P). SANTANDER: Puerto Berrío, *Haught 1729* (NY, W). TOLIMA: Caucho, east

* Continued from volume XLI, p. 258.

of Prado, *Little* 7171 (US); Hondo, *Humboldt* s.n. (p-lectotype, B), *Pennell* 3555 (GH, NY); Mariquita, *Fernández* 5637 (A). Without specific location: *Lehmann* 1097 (A, F, GH, NY), *Goudot* 0 (B), 1 (B). Dept. uncertain: Coyayoua, *Goudot* s.n. (P); San Luis, *Goudot* s.n. (p-type of *C. goudotiana*).

Coccoloba obtusifolia Jacquin, Enum. Pl. 19. 1760; Hist. Stirp. 114. 1763; Dugand, *Caldasia* 4: 428. 1947.

Coccoloba billbergii Lindau, Bot. Jahrb. 13: 219. 1890.

Jacquin's species was misplaced by Lindau and since that time, only Dugand, among the workers in South American floras, has included it. Jacquin stated the location of the species to be "Carthagenae in fruticosis & sylvaticis." Lindau placed the Jacquin name in the synonymy of *Coccoloba microstachya* Willd. under the variety *ovalifolia* Meisner. He did not cite Cartagena as a geographic location of the species or variety, but restricted *C. microstachya* to the northern Antilles. Meisner had previously recognized both *C. obtusifolia* and *C. microstachya*, but Lindau later noted that *C. obtusifolia* was published earlier than *C. microstachya* and so used the former name for the Antillean plant (Symb. Ant. 1: 222. 1899). In his study of the flora of Colombia Dugand noted that *Coccoloba obtusifolia* was based on a plant from Cartagena and referred several collections to this name. He did not express clearly the geographic distribution of the species, but, from the references given, one infers Dugand's acceptance of the Antillean-Colombian range. However, *Coccoloba obtusifolia* Jacquin and "*Coccoloba obtusifolia*" of authors of West Indian floras are not the same species, as I have pointed out in a previous paper (Jour. Arnold Arb. 38: 217. 1957). Lindau described the South American plant as *Coccoloba billbergii* and cited in synonymy "*Coccoloba obtusifolia* Meissn. (non Jacq.)," implying that he was creating a new species and that Meisner was in error.

Coccoloba obtusifolia is similar to and intergrades with several other species which are imperfectly known. The exact relationship to *C. peruviana*, *C. alagoensis*, *C. meissneriana*, *C. trianaei* and even *C. paraguariensis* cannot be determined at the present time. All but *C. meissneriana* were known to Lindau and considered in his monograph as belonging to section *Campderia*. Not one of them was known in fruit, however, and the placement of these species in *Campderia* was based on characteristics of the ocreolae and bracts. In his key to these species Lindau separated them on the basis of pubescence and leaf shape, both extremely variable characteristics. I am still handicapped by the lack of material, especially fruiting material of plants collected from the type locality of each species. I have considered uniting all of these species under *C. obtusifolia*, the oldest name for the complex, but have concluded that a wiser move at this time is to maintain all of the species, since it is impossible at present to distinguish them sufficiently to construct a key.

Coccoloba alagoensis was based on *Gardner* 1389 from Alagôas in Brazil. In most of the following specimens assigned to this species the leaves

are shorter, thicker and more obtuse at the apex than those of specimens assigned to *C. peruviana*. Lindau assigned *Riedel 821* from Cuyaba, Matto Grosso, to *C. alagoensis*, thus extending the range beyond Alagôas. In his monograph he cited the Gardner collection as well as *Riedel 821* and reported specimens in the Barbey-Boissier, Leningrad and Vienna herbaria without specifying the locations of the individual collections. There is no material of Riedel in the Boissier collection and the Vienna collection has been destroyed, but the Leningrad herbarium has four full sheets of *Riedel 821* comprised of eleven branches. None has been annotated by Lindau. However, in the Berlin herbarium, not cited by Lindau but annotated by him, is one sheet of the Riedel collection which represents only the smallest leaf form of the eleven branches at Leningrad. I believe Lindau received this deceptive fragment and from it cited the material at Leningrad. *Riedel 821* is more similar to material of *C. peruviana* and should be so named. However, if Lindau's identification were followed, *C. peruviana* and *C. alagoensis* could not be distinguished.

The name *Coccoloba alagoensis* can be applied with certainty only to the type. With some hesitation I assign to it also the following Brazilian collections: Bahia, Jacobina, *Blanchet 2668* (B, NY, P), identified and cited by Lindau as *C. ovata*; Rio de Janeiro, *Glaziov 11443* (B), identified and cited by Lindau as *C. floribunda*. Minas Geraes: Serra do Caraca, *Glaziov 19767* (B, P), identified but not cited by Lindau as *C. ramosissima*. *Blanchet 2713*, from Jacobina, Bahia, is apparently a mixture, in part *C. ovata* (q.v.), the remainder assigned here.

Coccoloba peruviana is similar and intergrades in leaf size, shape and pubescence. In his key to the species, Lindau distinguished *C. alagoensis* by a glabrous rachis and *C. peruviana* by a rachis more or less puberulent. The problems associated with the accurate identification of *C. peruviana* will be discussed under that name.

Coccoloba meissneriana has leaves larger than those of *C. obtusifolia* but in the same range as *C. peruviana*. The pubescence is uniformly thick on the lower surface and present on the midrib and veins on the upper surface. The few specimens assigned to *C. meissneriana* can be related to typical specimens of *C. obtusifolia* through many intermediate specimens called *C. peruviana*. *Coccoloba trianaei* has leaves with longer acuminate tips and shorter, stouter and more pubescent petioles. *Coccoloba paraguariensis* is similar to *C. alagoensis*, being a smaller-leaved species with thicker, oblong leaf blades, shining when dry and conspicuously veined.

When a large number of these specimens are studied, it becomes obvious that these species are all related, though many questions arise which can be answered only by careful field examination not possible at this time. In his original description of *Coccoloba billbergii* Lindau cited *Billberg 204* and *204a*, with specimens in herbaria at Berlin and Stockholm. I have seen these specimens and find them to be an exact match of Jacquin's illustration. There are apparently no specimens in existence of Jacquin's species, so it must be typified by the illustration. When this is done, Dugand is correct in calling material from Colombia *C. obtusifolia*.

There is also some difficulty in typifying *Coccoloba billbergii* Lindau. Lindau cited two numbered collections, *Billberg 204*, and *204a*, and two herbaria, Berlin and Stockholm. There is only one unnumbered fragment at Berlin, although it bears a label identifying it as a Billberg collection, possibly in Billberg's hand, as well as Lindau's identification label, but the specimen's being small and unnumbered suggests that it may have been taken from one of the Stockholm collections. However, since Lindau saw this fragment in preparing his monograph, it seems proper to designate this specimen in the Berlin herbarium as the lectotype.

Jacquin's illustration is definitive on several points. In fruit, *Coccoloba obtusifolia* has relatively long, reflexed pedicels. The lobes of the fruiting perianth are free below the middle, and the leaf blades, while basically oblong, show some variation in size and shape. Dugand stated that the plants are shrubs, very branched and low, to 2 meters high (or rarely to 4 or 5 meters high) occurring very commonly in the dry thickets of the Colombian Caribbean seacoast. The specimens which Dugand cited are from the states of Atlántico, Bolívar, Guajira and Magdalena. I have seen the majority of them, in addition to the many others cited below, and find in them a great range of variation in size and shape. The final delimitation of this species will require comprehensive field study.

Colombia. ATLÁNTICO: Usiacurí, *Molina & Barkley 19 At 0.54* (US). BOLÍVAR: Cartagena, *Billberg s.n.* (B-lectotype of *C. billbergii*), *Bro. Heriberto 164* (GH, NY), *Schott 857* (NY); Lopopa, *Billberg 204* (s), *204a* (s); Soplaviento, *Killip & Smith 14587* (A, GH, NY). MAGDALENA: Barranquilla, *Bro. Elias 574* (A); Codazzi, *Haught 3711* (A), *3808* (BR, NY); Donjaca, *Record 70* (A, GH, NY, Y); La Paz, *Haught 2326* (A); Palmar de Varela, *Bro. Elias 765* (NY); Puerto Colombia, *Bro. Elias 386* (NY), *Bro. Paul 854* (A); Quemadito, *André 221* (K, NY); Santa Marta, *Goudot "Z"* (B, P), *Smith 412* (A, B, BR, NY, P), *792* (A, BR, NY, P); without definite locality, *André K-1592* (K, NY), *s.n.* (P). Locality uncertain: Isletas (Rio Nari ?Hari?) *André K-1593* (K, NY), Palanda, *André K-1591* (K, NY), Babahoya, *André K-1594* (K, NY). **Venezuela.** DEMOCRACIA: La Crisa, *Christ 41* (NY). ZULIA: San Martín on Río del Palmar, *Pittier 10519* (GH, NY).

Coccoloba ochreolata Weddell, Ann. Sci. Nat. III. 13: 259. 1850.

Coccoloba blanchetiana Weddell, Ann. Sci. Nat. III. 13: 257. 1850.

Coccoloba bracteolosa Meisner, Fl. Bras. 5(1): 30. 1855.

Meisner was the first monographer to suggest that the two species described by Weddell were identical and, although there is some question whether Meisner saw all of the material that Weddell studied, Lindau (Bot. Jahrb. 13: 169. 1890) accepted his decision, citing the complete collections of Blanchet. I have seen the types and duplicates of both Weddell species and agree that they are to be considered identical.

Meisner also described *Coccoloba bracteolosa*, based on Martius collections from the state of Bahia. These flowering specimens have slightly immature leaves. In an earlier paper (Jour. Arnold Arb. 40: 211. 1959)

the species was referred to the synonymy of *C. parimensis* with the qualification that additional material might prove it to be better placed with *C. ochreolata*. I have now seen sufficient material to refer *C. bracteolosa* to the synonymy of *C. ochreolata* without hesitation. Lindau distinguished these species in the key in his monograph on the shape of the leaf base, narrowed in *C. bracteolosa* and rounded or cordate in *C. ochreolata*. He treated the species successively in the text, but I am unable to find any characteristics in the descriptions or in the specimens cited which would sustain a separation.

Mason & Harvey 6700, from Panama, previously cited by Lundell (Contr. Univ. Mich. Herb. 6: 9. 1941) as *Coccoloba bracteolosa* and referred by me to *C. parimensis* is correctly placed there. Likewise a Martius collection from Pará in the Brussels herbarium cited by Lindau as *C. bracteolosa* is also referred to *C. parimensis*.

Coccoloba ochreolata is very similar to *C. ilheensis*, especially at the time of flowering when the leaves are slightly immature. The latter species is not known in fruit. Additional collections are needed to determine the correct relationship of these two species.

Brazil. BAHIA: Jacobina, *Blanchet 3394* (B, LE, P), *3561* (P—holotype of *C. blanchetiana*, BR, LE, NY); Joazeiro, on Rio San Francisco, *Martius s.n.* (M—holotype of *C. bracteolosa*); without specific locality, *Blanchet 3410* (P—holotype), *3410B* (LE, NY, P), *Bondar s.n.* (F), *Clausen 46* (P). ESPÍRITO SANTO: between Campos & Victoria, *Sellow 405* (B). RIO DE JANEIRO: Maná, *Glaziov 18428* (P); Therezopolis, Serra dos Orgãos, *Glaziov 3088* (BR, P).

Coccoloba orbicularis Loddiges Cat. ex Loudon, Hort. Brit. 159. 1830.

In a list of stove plants with accompanying symbols to characterize the horticultural details of the plants Loudon cited this name which he attributed to the catalogue of the Loddiges Nursery at Hackney, near London, where he said the plant was introduced from South America in 1825. The only two Loddiges Catalogues available to me are those of the years 1820 and 1823, in which the name is not used. Later, in a list of excluded species Lindau (Bot. Jahrb. 13: 220. 1890) made the following notation: "*C. orbicularis* Lodd. = *Mühlenbeckia* (?) *orbicularis* Lodd." Jackson (Index Kewensis 1: 573. 1895) listed *Coccoloba orbicularis* Lodd. Cat. ex Loud. Hort. Brit. in italics as an excluded species, but referred it without hesitation to *Muehlenbeckia orbicularis*. However, the name "*Muehlenbeckia orbicularis*" is not listed in Index Kewensis under that genus, nor can I find it in any existing monograph or flora.

Loudon's symbolic description can scarcely be considered valid publication and thus the epithet should be considered a *nomen nudum*. Very probably the plant in question is *Coccoloba caracasana* described by Meisner in 1856.

Coccoloba ovata Benthams in Hooker, London Jour. Bot. 4: 627. 1845.

Coccoloba ovata var. *major* Meisner, Fl. Bras. 5(1): 31. 1855.

Coccoloba ovata var. *minor* Meisner, *ibid.*

Coccoloba ovata var. *lanceolata* Meisner, *ibid.*

Coccoloba moritzii var. *opaca* Meisner, Fl. Bras. 5(1): 28. 1855.

Coccoloba moritzii var. *lucida* Meisner *ibid.*

Campderia gracilis Meisner, Fl. Bras. 5(1): 26, pls. 6. 1855.

Coccoloba nigra Fawcett & Rendle, Jour. Bot. 51: 123. 1913; Fl. Jamaica 3: 120. 1914; Howard, Jour. Arnold Arb. 38: 106. 1957.

The current delimitation of *Coccoloba ovata* is not a satisfactory one. Only deliberate effort on the part of some collector in the area will obtain the necessary material to allow an understanding of the sexual condition, the habit and leaf variation and the true nature and development of the fruit.

As described by Bentham *Coccoloba ovata* was based on *Schomburgk* 531 and 893 from the first Schomburgk expedition. *Schomburgk* 531 (κ) is designated as the lectotype. In the discussion Bentham stated, "This species appears to have an extensive range, if specimens which I have from various parts of tropical Brazil and from the West Indies are, as they appear to be, referable to it. It agrees in many respects with the characters given of *C. obtusifolia*, Jacq., but the leaves, though variable in form, are never so narrow as those described by Jacquin; nor does the inflorescence agree at all with that attributed to the *C. microstachya*, Willd., which is said to differ chiefly from *C. obtusifolia*, by its broad leaves." Bentham does not cite any specimens from the West Indies and *C. ovata* is not known from there. *Coccoloba obtusifolia* Jacq. and *C. microstachya* Willd. have been misinterpreted and considered synonymous by some authors. In reality *C. obtusifolia*, though a variable species, is from Venezuela while *C. microstachya*, quite distinct from it, has its center of distribution in Puerto Rico and is not known from South America. I can agree with Bentham that *C. ovata* is not at all related to *C. obtusifolia* or to *C. microstachya*.

Bentham indicated the variability in leaf shape and size in the original Latin description and in his discussion. Meisner placed further emphasis on this variability when he described *C. ovata* var. *major*, citing specimens including *Schomburgk* 893 and varieties *minor* and *lanceolata* citing *Schomburgk* 531, in part, among the specimens assigned to each variety. I have not seen specimens bearing Meisner's annotation, but the specimens of *Schomburgk* 531 and 893 which I have seen I believe are easily accommodated in one species. The specimens appear to come from scrambling branches, although Bentham reported the plant to be a shrub.

Meisner also described *Coccoloba moritzii* in *Flora Brasiliensis*, recognizing two varieties as comprising the species. He cited only a collection from Colombia, *Moritz* 550, as representing *C. moritzii* var. *opaca* and a Schomburgk collection without number from British Guiana for *C. moritzii* var. *lucida*. The name *C. moritzii* was attributed to Klotzsch, who apparently wrote "*Coccoloba moritziana* Kl." on a specimen in the Berlin herbarium. This specimen cannot be located. A Schomburgk speci-

men without number bearing the name "*Coccoloba moritzii* Kl. β *lucida* Meisn." is in the collections of the Berlin herbarium. I find this specimen comparable in all characters to other material of *Schomburgk* 531 and believe the original collector's data were lost from this specimen. Lindau has placed *C. moritzii* and its varieties in the synonymy of *C. ovata*, and I believe this to be the correct handling of Meisner's species.

Bentham did not have the fruit when he described *Coccoloba ovata*, nor did Meisner when he considered the species in *Flora Brasiliensis* and the *Prodromus*. Lindau, however, did describe the fruit in his monograph (Bot. Jahrb. 13: 216, fig. 54. 1890) as follows: "Fructus ovoideus, circa 15 mm. longus, 7 mm. diametro, lobis accrescentibus coronatus, demum pericarpium carne evanida nervis carinalibus nervulisque persistentibus, ruber, facile deciduus." I have not seen all of the collections cited by Lindau, but the fruit which he described for *C. ovata* is present in packets on *Poeppig* 2617 and 2634, as well as on some of the recent collections cited below. The fruit is most unusual and is certainly atypical of even a broad concept of the genus. It is possible that after careful field study of *Coccoloba ovata* a new genus may be created to accommodate this species.

As presently known, *Coccoloba ovata* is a tree (possibly with scrambling branches), a shrub, or a vine. The leaves are mainly ovate but vary from lanceolate-ovate to oblong, narrowed or obtusely cordate at the base and obtuse, acute, or acuminate at the apex. The young branches, ocreae and petioles are crispose-pilose when young, becoming glabrate. The leaves are of firm texture and generally shiny on both sides when dry. The inflorescence ranges in length from 4 to 25 cm. and the flower clusters may be closely arranged or clearly distinct. The principal bract, subtending the flower, is generally black in color, ovate in outline but commonly long-attenuate at the apex. The ocreolae are membranaceous and conspicuous. Functionally staminate flowers tend to be numerous (ca. 10), functionally pistillate flowers (on other inflorescences) fewer (2-6). No specimens are available with both flowers and fruit. The pistillate flowers appear to be typical of *Coccoloba*. In fruiting condition the peduncles elongate, becoming 1-3 mm. long. In an occasional specimen the ocreola is fused to the peduncle. The fruiting perianth is large, becoming 15-17 mm. long. The hypanthium extends to the middle of the elongated achene and the perianth lobes extend well beyond the apex of the achene. The outer two, rarely three, perianth lobes are sharply keeled and appear to have been fleshy. The two inner perianth lobes scarcely exceed the apex of the achene and are flat. The perianth lobes are not tightly imbricate in the fashion found in *C. venosa* or Lindau's section *Campderia*, nor are they coronate, as Lindau stated, in the fashion of *Coccoloba swartzii*. In superficial aspect the fruiting perianth appears to be intermediate between *Symmeria* and *Triplaris*, or a fleshy elaboration of the imbricate-lobed type of the *Campderia* section. A number of the characteristics given above suggest that a special genus is required for *Coccoloba ovata*, but the lack of adequate field knowledge of this species prevents me from creating one at this time.

Campderia gracilis Meisner was described and illustrated in the *Flora Brasiliensis*. The original description refers to only one collection, *Spruce s.n.*, from Barra on the Rio Negro in Brazil. In the *Prodromus* Meisner reported specimens in Delessert and Munich herbaria. I have seen both of these specimens and six additional ones. No single specimen compares exactly with the illustration given in *Flora Brasiliensis*, and, consequently, I conclude that certain artistic liberties were taken. The original detailed sketch of the flower and fruit which appears on the *Flora Brasiliensis* plate is attached to a sheet in the Munich herbarium. This should be considered the lectotype. No achenes have been found on any specimens of this Spruce collection and I wonder where Meisner obtained the material for the illustration. Lindau assigned *Campderia gracilis* to the synonymy of *Coccoloba ovata*. If Meisner's illustration of the fruit of *Campderia gracilis* is correct and if, in following Lindau I have interpreted the fruit correctly, the species cannot be accommodated in *Coccoloba ovata*. However, if Meisner's illustration of the fruit is in error, as it appears to be on the basis of material I have seen, then *Campderia gracilis* must be considered as known only from flowering specimens and may well be placed correctly in the synonymy of *Coccoloba ovata*.

Passarge and Selwyn 491, made on the German Caura Expedition into the Guiana of Venezuela in 1901–1902, has been annotated with an unpublished name by Gross, who studied this specimen in the preparation of a treatment for *Pflanzenreich*. The majority of the new names he used appear to be unpublished. The present collection in the Berlin herbarium consists of two detached leaves and five detached inflorescences. The leaves are oblong-lanceolate and the inflorescences are from pistillate plants. The material is included in the broad concept of *Coccoloba ovata* which I am using.

Blanchet 2713 apparently is a mixture. A specimen so numbered in the *Prodromus* herbarium bears the label "villa de Barra" and belongs in this species, but a specimen carrying the same number, originally from Meisner's herbarium but now in the herbarium of the New York Botanical Garden, gives the location as "Serra de Jacobina Prov. Bahia" and is *Coccoloba alagoensis*.

Brazil. AMAZONAS: Barra, *Spruce 958* (M-lectotype of *Campderia gracilis*, B, G, GH, LE, P), *Blanchet 2713* in part (G); Manaos, *Ducke 348* (A, F, K, NY, US); Rio Coary, *Martius s.n.* (M); Rio Negro, *Spruce s.n.* (M); Rio Yapurá, *Martius s.n.* (M); without locality, *Poeppig 2617* (LE). BAHIA: Borba, *Riedel 1366* (LE, P). PARÁ: Bôa Vista on the Tapajoz River, *Dahlgren & Sella 61* (B, F); lower Cupari River, *Krukoff 1206* (A, NY, P). State unknown: Ega, *Poeppig 2634* (B, G, LE). **British Guiana.** DEMERARA: Matope Falls of the Cuyuni River, *Forest Dept. F-3380* (NY), *3382* (NY). Without locality: *Jenmann 1074* (P); *Schomburgk 531* (K-lectotype, BM, P), *893* (NY, P), *s.n.* (B). **Colombia.** VAUPÉS: Río Guaviare, *Molina & Barkley 215* (US); Río Inírida, *Fernández 2279* (A, US); Río Papunáua, *Fernández 2038* (A, US). **Venezuela.** AMAZONAS: Río Orinoco near mouth of Río Atabapo, *Wurdack & Adderley 42722* (A, NY). APURE: Río Cinaruco between mouth and Las Galeras de Cinaruco, *Wurdack*

& *Monachino* 41361 (A, NY). BOLÍVAR: Caño Coroso between Lago Coroso and Río Orinoco, *Wurdack & Monachino* 41192 (A, NY); Ciudad Bolívar, *Pittier* 13951 (US); Llanos de l'Aprure, *Geay s.n.* (P); Río Orinoco between Río Paragua and Río Horeda, *Wurdack & Monachino* 39878 (A, NY); Río Paragua, *Cardona* 1088 (F, NY, US); without specific locality, *Passarge & Selwyn* 491 (B). Country undetermined: Upper Orinoco, *Gaillard* 198 (P).

Coccolobis padifolia Rusby, Mem. N.Y. Bot. Gard. 7: 235. 1927.

The type of this species, *Mulford Biological Expedition* 848 (NY) from Rurrenabaque, Bolivia, has been compared with the type of *Coccoloba longipes* S. Moore from the Matto Grosso of Brazil. The species are the same and *C. padifolia* is referred to synonymy.

Coccoloba padiformis Meisner, DC. Prodr. 14: 166. 1856; Howard, Jour. Arnold Arb. 40: 210. 1959.

Coccoloba sphaerococca Lindau, Bot. Jahrb. 13: 185. 1890.

It has been pointed out previously that *Coccoloba padiformis* and *C. densifrons* are very similar. For the present *C. densifrons* is distinguished by its larger and heavier leaves which are generally broadest above the middle, by the conspicuous, arcuate, impressed primary venation and by the stouter and longer inflorescence axis.

Coccoloba padiformis is more similar to *C. sphaerococca*. Lindau described a puberulent inflorescence rachis for *C. padiformis* to distinguish it from *C. sphaerococca* which is supposed to have a glabrous one, but the type specimen of *C. sphaerococca* is an old fruiting specimen with some pubescence present in protected spots on the rachis, while the type specimen of *C. padiformis* is a staminate flowering branch, so Lindau's distinction does not seem reliable. *Coccoloba sphaerococca* was based on material collected at Tarapoto, Peru; *C. padiformis* is typified by a specimen from Caracas, Venezuela. Macbride assigned additional collections (*Killip & Smith* 29027, 27958 and *Williams* 3805) to *C. sphaerococca*, but I believe these specimens belong instead to *C. nutans*.

Lindau (Bot. Jahrb. 13: 201. 1890) broadened the original concept of *Coccoloba candolleana* to include material collected by Goudot in Colombia (*Goudot* 4) which is clearly to be referred to *C. padiformis*.

An additional species from Costa Rica has been previously referred to synonymy here (Howard, *loc. cit.*) and material has also been seen from Panama.

Colombia. CAUCA: Vallée du Cauca, *Triana* 975 (P). MAGDALENA: Mariquita, Piedras du Magdalena, *Triana* 976 (P); Santa Marta, *Smith* 1696a (A, NY), *Goudot* 4 (B, P). **Peru.** SAN MARTÍN: Tarapoto, *Spruce s.n.* (K-holotype of *C. sphaerococca*). **Venezuela.** FEDERAL DISTRICT: Caracas, *Moritz* 377 (M-holotype, G, LE, NY). MIRANDA: Pice de Naiguatá, *Pittier* 6190 (NY). ZULIA: Maracaibo Lake at Río Limón, *Curran & Haman* 796 (A, GH).

Coccoloba paniculata Meisner, Fl. Bras. 5(1): 43. 1855.

The typification of *Coccoloba paniculata* Meisner would be a difficult taxonomic problem, since Meisner included in the original citation the type of *C. polystachya* Weddell. Fortunately a solution is not necessary, since *C. mollis* Casaretto represents the older, legitimate name. A full discussion of the types and relationships is given under *C. mollis*.

Coccoloba paraensis Meisner, Fl. Bras. 5(1): 38. 1855.

This species was based on *Spruce* 957, from Manáos, Brazil, and a Martius collection from the state of Pará. I indicated in an earlier paper (Jour. Arnold Arb. 40: 211. 1959) my belief that this species is properly placed in the synonymy of *Coccoloba parimensis* Benth.

Coccoloba paraguariensis Lindau, Bot. Jahrb. 13: 218. 1890.

Coccoloba microphylla Morong in Morong & Britton, Enum. Pl. 212. 1892; Ann. N.Y. Acad. 7: 213. 1893, not Griseb. 1866.

Coccoloba morongii Hassler, Repert. Sp. Nov. 14: 162. 1915.

In the original description Lindau cited the single collection *Balansa* 2060 and only the specimen in the herbarium at Göttingen. It is important to note that the description and the specimen agree. Unfortunately this collection has proved to be a mixed one and specimens which I have seen bearing this number are all to be referred to *Coccoloba spinescens*, with the sole exception of the holotype at Göttingen. The misinterpretation of *C. paraguariensis* by recent workers has led to the confusion evident in the synonymy given here and under *C. spinescens*.

Coccoloba microphylla Morong was based on *Morong* 899 gathered along the Pilcomayo River in Paraguay. The epithet is a later homonym of *C. microphylla* Grisebach, as was recognized by Hassler, who renamed the species *C. morongii*.

Buchinger and Sanchez (Bol. Soc. Argent. Bot. 7: 251. 1959) have referred *Coccoloba paraguariensis* to the synonymy of *C. alagoensis* Weddell and have accepted *C. morongii* as a distinct species. I cannot agree with this treatment.

Coccoloba corrientina Rojas (Bull. Geogr. Bot. 28: 162. 1918), has been treated by Buchinger and Sanchez, *loc. cit.*, as an "especie dudosa" but with the suggestion of similarities to "*C. morongii*." Rojas' description is brief and generalized and no specimens are cited. Dr. Buchinger wrote that no material attributable to this species from the Rojas collection could be found. It is my belief that *C. corrientina* Rojas is properly placed in the synonymy of *C. paraguariensis*.

Argentina. CHACO: Fontana, *Meyer* 2.276 (A). CORRIENTES: Puente Pesca, *Ibarrola* 251 (W). FORMOSA: *Jørgensen* 1985 (GH, US), *Rojas* 11557 (A). **Paraguay.** Along the Pilcomayo River, *Morong* 899 (NY-type of *C. microphylla*, GH), *Rojas* 196 (GH), 196a (B, GH, K); escarpments along the Río Paraguay, *Balansa* 2060 in part (GOET-holotype).

Coccoloba parimensis Benth in Hooker, London Jour. Bot. 4: 626. 1845; Howard, Jour. Arnold Arb. 40: 211. 1959.

Coccoloba parimensis var. *schomburgkii* Meisner, Fl. Bras. 5(1): 35. 1855.

Coccoloba excelsa var. *glabra* Lindau, Bot. Jahrb. 13: 171. 1890.

Coccoloba paraensis Meisner, Fl. Bras. 5(1): 38. 1855.

A full discussion of *Coccoloba parimensis*, its variations and relationships is given in the earlier paper cited above, where additional specimens from Panama are referred to this species.

Brazil. AMAZONAS: Airão, Rio Negro, *Murca Pires* 243 (NY, US); Barra, *Spruce s.n.* (B, GH, LE); Ega, *Poeppig* 2670 (LE); Humaytá near Livramento, *Krukoff* 6606 (A, BR, LE, NY); Manáos, *Ducke* 1289 (A, F, NY, US); Panuré, Rio Uapes, *Spruce* 2732 (B, G); Paraná, de São José de Arirahá, *Baldwin* 3299 (US). PARÁ: Eastern region, *Martius s.n.* (BR); Iquapémirim, *Martius s.n.* (M). **British Guiana.** Barima River, Northwest District, *De La Cruz* 3359 (GH, NY, US); east of Atkinson Field, *Irwin* 241 (US); Malali, Demerara River, *De La Cruz* 2668 (GH, NY, US). **French Guiana.** Cayenne, *Martin s.n.* (K); Savane de Charvin, near St. Laurent, *Cowan* 38874 (NY). **Peru.** LORETO: Mishuhuaca near Iquitos, *Klug* 1592 (A, F, NY); Yurimaguas, *Llewelyn Williams* 4528 (F). **Venezuela.** AMAZONAS: Caño Avatapure, *B. & C. Maguire* 35526 (A, NY); Maroa, Río Guainia, *Llewelyn Williams* 14259 (F, US); Pimichín, *Llewelyn Williams* 14188 (F); Pto. Ayacucho, Río Orinoco, *Curran* 1813 (NY). BOLÍVAR: Alto Cuyuni, Río Chicanang, *Cardona* 2767 (NY).

Coccoloba parvifolia Schott in Sprengel, Syst. Veg. 4(2): 405. 1827; Lindau, Bot. Jahrb. 13: 175. 1890, not Poiret (1804).

Lindau accepted the epithet *Coccoloba parvifolia* Schott in his monograph of the genus. He referred the older name, *C. parvifolia* Poiret (Lam. Encycl. 6: 64. 1804), to the synonymy of *C. microstachya* var. *ovalifolia* Meisner. Under the present rules of nomenclature, *C. parvifolia* is preoccupied and *C. parvifolia* Schott is a later homonym. The correct name for this species is therefore *C. rigida* Meisner.

The original description of *Coccoloba parvifolia* Schott is brief and no specimens are cited. A specimen in the Berlin herbarium obtained with the Kurt Sprengel herbarium is presumed to be the holotype. This herbarium was acquired after 1890 and the specimen in question was not annotated (and perhaps not seen) by Lindau. The Berlin herbarium does contain four collections (*Schott* 5538, *Riedel* 683, *Schenck* 3939, and *St. Hilaire* 138) which Lindau saw and annotated. The Sprengel herbarium specimen without number matches *St. Hilaire* 138.

Coccoloba peltata Schott in Sprengel, Syst. Veg. 4(2): 405. 1827; Lindau, Bot. Jahrb. 13: 181. 1890.

Coccoloba peltigera Meisner, Fl. Bras. 5(1): 39, *pl.* 17. 1855.

Coccoloba nymphaeifolia Schenk in Zittel, Handb. Palaeont. 2: 491. 1887, nomen nudum.

Coccoloba erecta Glaziou, Bull. Soc. Bot. Fr. IV. 11(Mem. 3f): 572. 1911, in part.

Coccoloba peltata is listed in Sprengel's *Systema* with a very short description and no specimens are cited. The specimen from the Sprengel herbarium now at Berlin consists of a single detached leaf, but this was collected by Schott. It is not annotated by Lindau and perhaps was not seen by him. Nevertheless, this specimen must be considered the holotype of *C. peltata*.

Meisner recognized *Coccoloba peltata* but did not see any material and only repeated the original description. At the same time Meisner described *C. peltigera*, recognizing it as only slightly different from the inadequately described *C. peltata*. Lindau reduced *C. peltigera* to synonymy under *C. peltata* Schott, and I believe he was correct in doing so.

For *Coccoloba peltigera* Meisner cited *Martius* 238 and *Poeppig* 2670, placing in synonymy the manuscript name "*Coccoloba scandens* Poeppig" for the latter specimen. The illustration given in *Flora Brasiliensis* was compiled from two specimens of *Martius* 238, now in the Munich herbarium. No type was selected, but it seems desirable to designate *Martius* 238 as the lectotype of *C. peltigera*. *Martius* did not give the location of the Poeppig specimen, but Lindau referred to the same manuscript name on a specimen in the Vienna herbarium. This collection at Vienna was lost during World War II, but a specimen of the same number without the manuscript name is in the Leningrad herbarium. This specimen is to be referred to *C. parimensis*.

I have already discussed the epithet *Coccoloba nymphaeifolia* (q.v.) which is a *nomen nudum*. I have also previously indicated that *C. erecta* Glaziov must be considered a *nomen nudum*. However, in the place of publication Glaziov cited *Glaziov* 14220 for *C. erecta* and *Glaziov* 14219 for *C. schwackeana*. Unfortunately both of these collections are mixed and specimens labeled *Glaziov* 14219 may be either *C. schwackeana* or the present species.

Coccoloba peltata is not well represented in herbaria but appears to be characterized, as originally described, by having leaves with long petioles and blades which are usually, but not always, peltate. In petiole length it compares with *C. tiliacea* from Argentina, a species which also has peltate or non-peltate leaves. *Coccoloba tiliacea* differs in having pedicellate flowers and fruits on lax or more tenuous rachises. The specimens cited below are mostly from lianas or "ropelike" branches. The species is not known in fruit. Many of the specimens give the impression of representing abnormal growth forms. Leaf blades vary in size and shape, in many cases approaching the thick leaf types of *C. marginata*. The inflorescence has been found divided and is apparently fasciated in *Glaziov* 14219 (LE). A study of this species in the field may reveal it to be only a teratological or abnormal form of some other species. For example, it is possible that some of the material I have called *C. marginata*, particularly the Salzmann collections from Bahia labeled "*Coccoloba pendula*" or "*Coccoloba nitida* var. *cordata*" in herbaria, may be the normal expression of *C. peltata*. At present the distinctions between *C. marginata* and *C. peltata* are not clear.

Brazil. RIO DE JANEIRO: Copacabana, *Nadeaud s.n.* (P); Corcovado, *Beyrich s.n.* (P); São Christovão, *Glaziou 14219* in part (LE, P); without specific location, *Glaziou 144* (BR, P), *Martius 238* (M—holotype of *C. peltigera*). Without location: *Schott s.n.* (B—lectotype of *C. peltata*), *Clausen 57* (P). **Cultivated material:** *Herb. Fischer* (LE), *Herb. Lips.* (B).

Coccoloba pendula Salzmann ex Lindau, Bot. Jahrb. 13: 180. 1890.

This epithet was invalidly published by Lindau in the synonymy of his "*Coccoloba nitida*." I have restricted *Coccoloba nitida* HBK., both in definition and distribution, and cannot include the Salzmann specimens cited by Lindau. These specimens from Bahia, Brazil, are all without numbers but bear different annotations; e.g., "*C. pendula*," "*C. nitida* var. *cordata*" or "*C. tenuifolia* Lam.," and have been seen in many European herbaria. All should be referred to *C. marginata*, with the possibility that they may represent normal growth forms of *C. peltata*.

Coccoloba persicaria Weddell, Ann. Sci. Nat. III. 13: 256. 1850.

This species is similar to *Coccoloba gracilis*, *C. obtusifolia*, and *C. spinescens*. At present it is distinguished by the broader leaves, shorter petioles and more pubescent branches and foliage. The holotype is in the Paris herbarium and a fragment of the holotype is in Berlin.

A second collection from Bolivia, *Kuntze s.n.*, should be assigned here. In the preparation for a treatment of this genus for Pflanzenreich, Gross assigned new names to many collections. Some of these names were published in short notes, often in obscure publications. This particular collection bears a specific name honoring Otto Kuntze, and, if it has been published, it should be assigned to the synonymy of *C. persicaria*.

Bolivia. Tunari, *Kuntze s.n.* (B, NY); Yungas, *Weddell 4257* (P—holotype, B).

Coccoloba peruviana Lindau, Bot. Jahrb. 13: 213. 1890.

Lindau described this species and cited two collections, *Ruiz & Pavon 229* and *D'Orbigny 571*, in the original publication. Macbride (Field Mus. Pub. Bot. 13: 461. 1937) also considered the species, adding three collections, *Llewelyn Williams 2482*, *6847* and *6852*, and designated as the type *Ruiz & Pavon 229*. No location was given for the lectotype, but a photograph of the Ruiz and Pavon specimen in the Berlin herbarium is deposited at the Chicago National History Museum. The photograph bears the general label, "Types of the Berlin Herbarium," and, since Lindau annotated the sheet, it seems proper to accept the fragments, a small sterile shoot, a detached inflorescence and a single leaf, as the holotype. Additional and better specimens of this collection have been seen in the herbaria at Geneva. Another specimen, presumably of the same collection but without number, was obtained by the Chicago Natural History Museum recently from the Ruiz & Pavon collections at Madrid. I have seen *D'Orbigny 571* from Bolivia in the herbarium at Paris and

there is no question that the Ruiz and Pavon and D'Orbigny collections, both of which are in flower, represent the same species. I have also seen the Williams collections cited by Macbride. *Williams 6847* has very few flowers left on one of several inflorescences present on the sheet. *Williams 6852* is comparable in all respects except for a number of immature fruit found in a packet. Both specimens show smaller leaves of thinner texture than do the specimens first cited by Lindau. *Williams 2482* has leaves comparable to the Ruiz & Pavon type, but attached to the sheet is a packet containing fruits which are different from those of *Williams 6852*, although similar to those of *C. ovata* which I find difficult to accommodate in the genus. In mature condition these fruits have a jet-black, triangular achene, one-third to one-half the length of the membranaceous perianth lobes, which are free to the base in fruit and expanded, imbricate, heavily veined and membranaceous. In contrast to these are the fruits of *Ule 9349* made along the Rio Acre. These fruits are typical of *C. obtusifolia*, with tightly appressed perianth lobes free to the base and scarcely exceeding the smaller, tan-colored achenes. The leaves and inflorescences of the Ule collection compare favorably with the Ruiz and Pavon collection. The Riedel collection from Cuyaba has fruits comparable to *Ule 9349*. I am unable to determine from the material at hand which fruit type belongs with *C. peruviana* as typified by *Ruiz & Pavon 229*. Until field studies can be made or more adequate collections are available which will show fruit variation within a population, as well as staminate and pistillate inflorescences, *C. peruviana* will not be clearly defined.

Bolivia. Without specific location, *D'Orbigny 571* (P). **Brazil.** AMAZONAS: Rio Acre, *Ule 9349* (G, K, NY, US). MATTO GROSSO: Cuyabá, *Riedel 821* (B, LE, P). **Peru.** LORETO: Middle Ucayali, *Tesmann 3226* (F, NY), *3231* (NY). SAN MARTÍN: Juan Guerra, *Williams 6847* (F), *6852* (F). Without specific location: *Ruiz & Pavon 229* (B-lectotype, G), *s.n.* (F).

Coccoloba pichuna Huber, Bol. Mus. Goeldi 5: 342. 1909.

This species is based on *Ducke 4866*, from Obidos, Pará, Brazil. I have seen a duplicate in the British Museum. The species is to be referred to the synonymy of *Coccoloba densifrons* Martius ex Meisner.

Coccoloba pipericarpa Martius ex Meisner, Fl. Bras. 5(1): 32, *pl.* 12. 1855.

The holotype in the Munich herbarium bears a tag with the number 838. No collector's number has been cited for this specimen and it is possible that the tag was added at a later date. The specimens at Munich bear several geographic locations on each label and the specific location where these collections were made cannot be determined accurately. The specimen selected as the lectotype is in the best condition and has the most definite locality. It is also the specimen on which the illustration in *Flora Brasiliensis* is based. However, the fruits of this specimen were all insect-infested

in the field and considerable artistic liberty was taken in depicting them for the illustration. *Coccoloba pipericarpa* is a small-leaved species not clearly defined at present for want of adequate material.

Brazil. BAHIA: Joazeiro, *Martius s.n.* (M-lectotype). MINAS GERAES: Minas Novas, *Martius s.n.* (B, M). RIO DE JANEIRO: Rio de Janeiro, *Glaziov 15357* (B).

Coccoloba pittieri R. Knuth ex Pittier, Man. Pl. Usuales Venez. 355. 1926.

In an earlier paper (Jour. Arnold Arb. 40: 89. 1959) I have referred this species to the synonymy of *Coccoloba striata*. The species was based on *Pittier 8880* from Carababo, Guaremales, Venezuela.

Coccoloba plantaginea Weddell, Ann. Sci. Nat. III. 13: 257. 1849.

The type and only collection referred to this species is *Blanchet 1491* (G-holotype, B, NY) from the state of Bahia, Brazil. The specimens I have seen are from lianas, for the stems are tenuous with long internodes. The short lateral shoots bear clusters of leaves and immature inflorescences, all parts of which are densely pubescent. I suspect this species of having a close relationship with *C. crescentiifolia*. Further collections from this area of Brazil will doubtless determine whether both species should continue to be recognized.

Coccoloba populifolia Weddell, Ann. Sci. Nat. III 13: 257. 1850.

In the original description Weddell cited two collections, *Blanchet 1486* and *1646*, from Bahia, Brazil, without designating a type.

Meisner (Fl. Bras. 5(1): 40, *pl. 18*. 1855) referred *Coccoloba alnifolia* Casaretto, an older name, to the synonymy of *C. populifolia* with a question. Lindau saw the Casaretto specimen and accepted the two species as identical (Bot. Jahrb. 13: 198. 1890). I have checked authentic material of both species and agree with this conclusion. I have therefore referred *C. populifolia* Weddell to the synonymy of the older name, *C. alnifolia* Casaretto (*q.v.*).

Coccoloba praecox Herter, Revista Sudam. Bot. 10: 38. 1952.

Herter based this species on his own collection (*Herb. Herter 50852*) made near Arapey, Dept. Salto, Uruguay. The species was characterized by having fascicled flowers which appeared before the leaves. I have seen an isotype in the Paris herbarium. The species can be assigned to the synonymy of *Coccoloba argentinensis* Spegazzini (*q.v.*). *Coccoloba praecox* Herter is a later homonym of *C. praecox* Wright ex Lindau (Bot. Jahrb. 13: 142. 1890).

Coccoloba pubescens L. Syst. ed. 10, 1007. 1759.

Coccoloba grandifolia Jacquin, Enum. Pl. Carib. 19. 1760.

This is a well-defined species of the Caribbean Islands and one which is frequently seen and collected in the large-leaved juvenile form. It is not known from South America, although the older literature contains such references.

Meisner (Fl. Bras. 5(1): 42. 1855; DC. Prodr. 14: 152. 1856) in his treatments of the genus gave the distribution as the Antilles, Mexico, British Guiana and Dutch Guiana, and suggested that the species might be expected to occur in Brazil. The report of *Coccoloba pubescens* from Mexico was based on *Schiede 60* which I concluded (Jour. Arnold Arb. 40: 212. 1959) to represent either an adventitious growth form of *C. liebmannii* or cultivated material of doubtful origin.

The reference to this species in Dutch Guiana is based on *Kegel 1339*. Lindau in his monograph (Bot. Jahrb. 13: 133. 1890) cited this collection under both *Coccoloba polystachya* var. *pubescens* and *C. pubescens*, although he attributed the latter placement to Meisner. I have not seen the Kegel specimen but Eyma, who did, referred the collection to *C. mollis* (Meded. Bot. Mus. Utrecht 4: 4. 1932).

The occurrence of *Coccoloba pubescens* in British Guiana is based on Bentham's study of the Schomburgk collection from the upper Rupununi River (Hook. London Jour. Bot. 4: 624. 1845). I have not been able to locate this specimen, but I question its identification as *C. pubescens* and suggest that it be checked against *C. mollis* or *C. savannarum*.

Coccoloba racemulosa Meisner, Fl. Bras. 5(1): 30. 1855.

This species was described by Meisner on the basis of an unnumbered Martius collection from Minas Geraes. I have previously referred this species to the synonymy of *Coccoloba declinata* (Vellozo) Martius. *Perrottet 83* from British Guiana which Lindau (Bot. Jahrb. 13: 168. 1890) cited for this species should be identified as *C. lucidula* Bentham.

Coccoloba ramosissima Weddell, Ann. Sci. Nat. III. 13: 258. 1850.

Coccoloba laxiflora Lindau, Bot. Jahrb. 13: 191. 1890.

Lindau described *Coccoloba laxiflora* in his monograph of the genus without any comment on its affinities. The type and only specimen cited is *Glaziou 11444* (B), which consists of one detached mature leaf and several attached leaves which are membranaceous and obviously immature. The type of *C. ramosissima* is *Blanchet 2421*. Lindau separated them in his key on the shape of the leaf base. While all the leaves of *Glaziou 11444* are smaller than those of *Blanchet 2421*, there is little doubt that these species are the same. The type of *Coccoloba laxiflora* was collected in Rio de Janeiro, according to the data on the label, but was

cited from Espírito Santo by Glaziou (Bull. Soc. Bot. Fr. IV. 11(Mem. 3f): 571. 1911).

Coccoloba longipes S. Moore (*q.v.*) is similar to the present species. The type collection, *Moore 577*, from the Matto Grosso, represents a rampant shrub or a liana. Both growth conditions are apparent in the specimens I have seen. Moore compared his species with *C. ramosissima* and distinguished it on the basis of larger leaves and longer inflorescences. Additional collections from southern Brazil may clarify the relationship of these species.

Brazil. BAHIA: without location, *Blanchet 2421* (p-holotype of *C. ramosissima*, B, G). RIO DE JANEIRO: without location, *Glaziou 11444* (B-holotype of *C. laxiflora*, C, K).

Coccoloba recurva Newman ex Lindau, Bot. Jahrb. 13: 180. 1890.

Lindau indicated that this epithet was a manuscript name on a specimen in the herbarium at Geneva and published the name in the synonymy of *Coccoloba nitida*. The specimen came from Brazil but the exact locality is not known. A specimen in the general herbarium at Geneva, *Newman 158*, may be the one to which Lindau referred. This is clearly the same as *Coccoloba marginata* Benth.

Coccoloba riedelii Lindau, Bot. Jahrb. 13: 137. 1890.

Lindau cited only *Riedel 613* in the Leningrad herbarium in his original description, so this specimen must be considered the holotype. A full sheet is now in the Berlin herbarium. The type collection was made at Ilheos, Bahia, Brazil. Lindau distinguished this species from *Coccoloba rosea* Meisner, another species represented by a single collection from the same location as *C. riedelii*, on the size and shape of the leaves. The type specimen of *C. riedelii* appears to represent the mature leaf form and that of *C. rosea* a younger leafy branch; therefore I refer *Coccoloba riedelii* to the synonymy of *C. rosea* Meisner.

Coccoloba rigida Meisner, Fl. Bras. 5(1): 29. 1855.

Coccoloba parvifolia Schott, in Sprengel, Syst. Veg. 4(2): 405. 1827; Lindau, Bot. Jahrb. 13: 175. 1890, not *C. parvifolia* Poiret in Lam. Encycl. 6: 64. 1804.

When *Coccoloba rigida* was described by Meisner, he cited only "*Schott 5538 (912)*" from "Sebastianopolitana" in the Vienna herbarium. The materials of *Coccoloba* in the Vienna herbarium were destroyed during World War II, but a packet containing several leaves and a short piece of the inflorescence from the Meisner herbarium is now at the New York Botanical Garden. The packet bears the annotation "Brasilia (loco non indicato) Schott n 5538 (912) in Hb. Mus. Vindobon." This is the only material of this collection known to me and should be considered the lecto-

type. The fragments are comparable to material of *St. Hilaire* 138, which is more widely distributed.

The name *Coccoloba parvifolia* Schott in Sprengel which Lindau accepted for this species, citing *C. rigida* in synonymy, is a later homonym of *C. parvifolia* Poiret. Poiret's species is correctly identified as *C. microstachya* Willd. I am not certain what is the type of *C. parvifolia* Schott, since no specimens were cited in the original description. Lindau later mentioned four specimens in his treatment of the species but did not designate a type. After the publication of his monograph the Berlin herbarium acquired the Kurt Sprengel herbarium. A scanty specimen from that herbarium bears the annotation "*C. parvifolia* Schott." Lindau did not annotate this specimen and possibly never saw it. I believe this to be the holotype of *C. parvifolia* Schott. The fragmentary material is comparable to the equally fragmentary holotype of *C. rigida* and it is possible that both species are based on the same collection.

Coccoloba rigida is similar to *C. brasiliensis* but is distinguished from it, at least on the basis of present collections, by its smaller leaves which are obtuse at the base and borne on thin petioles. A dense inflorescence is distinctive in *C. rigida* and the rachis is densely and persistently puberulent.

Brazil. RIO DE JANEIRO: Cabo Frio, *Riedel* 683 (TO), *Glaziov* 19766 (P), *Schenck* 3939 (B); without specific location, *St. Hilaire* 138 (B, P). State not known: *Schott* 5538 (NY—lectotype of *C. rigida*), *s.n.* (B—holotype of *C. parvifolia* Schott).

***Coccoloba rigida* Willd. ex Lindau, Bot. Jahrb. 13: 188. 1890.**

The epithet "*Coccoloba rigida* Willd." has appeared in several lists of species from South America. Fortunately it has no validity. Lindau cited this epithet as a manuscript name in the synonymy of *C. humboldtii*, a species from Mexico. He indicated that it was based on a specimen numbered 7705 in the Willdenow herbarium. I have not seen this name validly published and certainly hope it never was.

The collection in the Willdenow herbarium numbered 7705 is *Humboldt* 4484, which I have designated as the lectotype of *C. humboldtii* (Howard, Jour. Arnold Arb. 40: 198. 1959). Another specimen of the same number in the Paris herbarium, clearly the same species, bears a label indicating the origin as Vera Cruz and was annotated by Lindau as "*Coccoloba nutans*."

***Coccoloba rosea* Meisner, Fl. Bras. 5(1): 33. pl. 14, fig. 2. 1855.**

Coccoloba riedelii Lindau, Bot. Jahr. 13: 137. 1890.

The holotype of *Coccoloba rosea* was collected by Luschnath at Ilheos, Bahia, Brazil, on October 27, 1839. It is the only specimen cited by Meisner and is currently preserved in the Brussels herbarium. The specimen consists of one shoot, obviously a young branch with immature

leaves. Considerable artistic liberty was taken in preparing the illustration published, but there is no question of its being of the Brussels specimen.

The specimens of *Riedel* 613 on which Lindau based *Coccoloba riedelii* are more mature and vigorous shoots. They are comparable to *C. rosea* in all details of the inflorescence, pubescence and leaf venation. Only the leaves of *C. riedelii* are larger than those of *C. rosea*. Lindau listed these species successively in his monograph and indicated that *C. rosea* is smaller and more graceful than his new *C. riedelii*. In his key he distinguished them on the conspicuousness of the secondary venation. It is clear to me that the age of the specimens represents the only difference between them and that *C. riedelii* must be considered a synonym of *C. rosea*.

A sterile specimen in the Berlin herbarium, *Sellow* 3120 from Brazil, was annotated by Lindau as "*Coccoloba* aff. *pubescens* vel *latifolia*." The specimen has extremely long, hollow internodes. The ocreae are 4–5 cm. long and the petioles arise 1.5–2 cm. above the base. The petioles are 4 cm. long and bear oblong blades 25 cm. long and 18 cm. wide. This specimen appears to me to be an adventitious shoot which should be referred to *C. rosea*.

Brazil. BAHIA: Ilheos, *Luschnath* s.n. (BR-holotype of *C. rosea*, B), *Riedel* 613 (LE-holotype of *C. riedelii*, B, BM).

***Coccoloba rubiginosa* Martius ex Meisner, Fl. Bras. 5(1): 33. 1855.**

This epithet was published in the synonymy of *Coccoloba acrostichoides* Cham. by Meisner. The associated collection must be the collection by A. Niemann made in 1832 in Minas Geraes, Brazil. A specimen from the Martius herbarium bearing this name is now in the Brussels herbarium.

***Coccoloba rubra* L. B. Smith, Jour. Wash. Acad. 45: 197, figs. 1–4. 1955.**

Smith attempted to use Lindau's faulty key in comparing his new species with *Coccoloba schwackeana*. A more correct comparison would be with *C. warmingii*. I have seen the types of both species and conclude that *C. rubra* is to be referred to the synonymy of *C. warmingii*. The type of *C. rubra* is the collection made by R. Klein in Santa Catarina, Brazil, bearing the number *Institute of Malariology* 33.

***Coccoloba ruiziana* Lindau, Bot. Jahrb. 13: 215. 1890.**

Lindau did not indicate a type when he described this species. He cited three collections, *Ruiz & Pavon* 228, which he stated was from Peru, and *Spruce* 6340 and *Andersson* s.n., from Ecuador. The Ruiz & Pavon specimen in the Barbey-Boissier herbarium at Geneva should be designated as the lectotype. It is clearly from the Guayaquil area of Ecuador and not Peru.

Lindau placed this species in his section *Campderia*. However, *Coccoloba ruiziana* is not well defined and field studies are deemed necessary to determine the range of variation to be expected. The specimens cited below are suggestive of *C. obtusifolia* and *C. cujabensis*. From the former, *C. ruiziana* differs in the complete lack of pubescence on the lower leaf surface and in the broader leaf shape. The latter species is defined by the cordate leaf bases and the heavy primary venation. Additional collections are needed to clarify the relationship of these species.

A very pubescent specimen, *Eggers 15526*, is represented by two specimens in the herbaria of the Chicago Natural History Museum and the Berlin Botanical Garden. The specimen from Berlin bears Gross' annotation label with an unpublished specific name referring to "false stipules." The ocreae of the young shoots are often recurved and appear as stipules in this collection and in material of *Coccoloba ruiziana* and *C. spinescens*. The material on hand is inadequate for a reliable description and for the present is considered a pubescent phase of *C. ruiziana*. As such, it becomes intermediate between *C. meissneriana*, *C. obtusifolia* and *C. ruiziana*. It was collected either at Agua Amarga or El Recreo in Ecuador. The two labels carry different data as to location and date of collection.

Ecuador. GUAYAS: Guayaquil, *Ruiz & Pavon 228* (G-lectotype); between Guayaquil & Salinas, *Hitchcock 19989* (GH, NY); Isla Puná, *Andersson s.n.* (B); Posorja, *Mille 786* (F). MANABI: Caracas Bay, *Lehmann BT 748* (NY); El Recreo at Río Mudincho, *Eggers 14929* (F, M, P, US). Locality uncertain: Chanduy, *Spruce 6340* (F, LE, NY, P), Balao, *Eggers 14567* (A, B, LE, M). **Peru.** LAMBAYEQUE: Supo, *Townsend A-135* (F). PIURA: Chulucanas, *Weberbauer 6435* (F, GH); Negritos, *Haught F15* (F). TUMBES: Haciendas Casitas & Ricaplaya, *Weberbauer 7738* (F). Locality uncertain: Talara, *Haught 87* (NY).

Coccoloba sagittata Larranaga, Pub. Inst. Hist. Geog. Uruguay, Escritos 2: 147. 1923.

There is some doubt in my mind whether this was intended to be a new species. Larranaga stated only, "Yo he encontrado la siguiente: 1.a *Coccoloba sagittata* — foliis oblongis sagittatis, angulis posticis brevibus, racimis erectis, compositis. Sp. n. Marzo 19 de 1814." He followed this brief description with a discussion of the properties and uses of the plant which he referred to as climbing and common, and ended with a sentence on the culture of the species. No specimens were cited and none comparable to this description have been seen from Uruguay. The date "1814" may be a typographical error for "1914." The species cannot be identified from the description given and the name cannot be used since there is an earlier homonym by Poiret.

Coccoloba sagittata Poiret, in Lam. Encycl. 6: 64. 1804.

In considering the species excluded from *Coccoloba* for his treatment in Flora Brasiliensis, Meisner cited "*COCCOLOBA SAGITATA Poir.*" and

"COCCOLOBA SAGITTIFOLIA *Orl.*" (Fl. Bras. 5(1): 44. 1855). Both were referred to *Muhlenbeckia sagittifolia* (Ortega) Meisner. I have not seen authentic material but agree that the Poiret species does not belong in *Coccoloba*.

Coccoloba sagittifolia Ortega, Plant. Horti Reg. Bot. Matrit. 60. 1798.

Ortega described fully a specimen growing in the botanical garden at Madrid. Although the native country was given as Brazil, the seed was obtained by Broussonet in Africa. Meisner (Pl. Vasc. Gen. 2: 227. 1843) first tentatively suggested that the species belonged in his new genus *Muhlenbeckia* and later reaffirmed the placement (DC. Prodr. 14: 148. 1846).

Coccoloba sagotii Lindau, Bot. Jahrb. 13: 184. 1890.

The material which Lindau described as *Coccoloba sagotii* is the mature leaf form of *C. lucidula* Benth. A *Sagot s.n.* collection was cited in the original description and although two specimens of it, both of which are fragmentary, were seen by Lindau in herbaria at Berlin and Stockholm, there is an ample sheet in the Paris herbarium which is an isotype.

Coccoloba salicifolia Weddell, Ann. Sci. Nat. III. 13: 259. 1850.

This species, which grows as a woody vine, appears to be distinct on the basis of its narrow, lanceolate leaves, although the full range of leaf variation is not known. The type (*Claussen 4*) is in flower. Lindau cited additional Claussen specimens which I have seen and *Schwacke 5801* which I have not seen. Lindau also added a description and illustration of a fruit which may be that of the Schwacke collection. Two additional sterile collections, *Glaziou 3086* and *3090*, have been identified by Lindau as this species. The first collection has larger leaves, considerably different in shape and appearance from the Claussen type. Additional collections and field study of the species is needed.

Brazil. RIO DE JANEIRO: NUOVO Friburgo, *Claussen 4* (P-holotype, B, BR, F, NY), *2002* (NY), *2094* (G); Rio de Janeiro, *Glaziou 3086* (BR), *3090* (BR).

Coccoloba sarmentosa S. Moore, Trans. Linn. Soc. II. 4: 446. 1895.

The type collection of this species is *Moore 1038* from Paraguay. It is regarded as a very pubescent phase of *Coccoloba spinescens* Morong and is referred to synonymy there.

Coccoloba savannarum Standley in A. C. Smith, Lloydia 2: 177. 1939.

This species is still known only from the type *Smith 2225* collected in a scrub savanna in the basin of the Rupununi River in British Guiana. The species appears to be similar to *Coccoloba rosea*, differing in the smaller

ocreae and in having a lax inflorescence with the flowers borne on short pedicels. Both species are inadequately known at present. The type is at the Chicago Natural History Museum with isotypes at the Arnold Arboretum and the New York Botanical Garden.

It is possible that the material collected by Schomburgk from the Upper Rupununi which Bentham referred to *Coccoloba pubescens* (Hook. London Jour. Bot. 4: 264. 1845), may represent adventitious leaves of this species.

***Coccoloba scandens* Casaretto, Nov. Stirp. Bras. 8: 70. 1844.**

Lindau (Bot. Jahrb. 13: 184. 1890) cited this species in the synonymy of *Coccoloba sticticaulis*. Apparently, however, he did not see the type (Casaretto 76), for this specimen is cited neither under *C. sticticaulis* nor in his list of specimens studied. The Casaretto herbarium is extant at Turino, but I have not been able to see this specimen. Since Lindau was in error in several other instances where he cited Casaretto species, reducing them without seeing the specimens involved, it seems advisable to list this species without placement at the present time. This reference appears to be the earliest valid publication of the name *Coccoloba scandens*. The specific epithet has been used at least four times in the genus, mostly as *nomina nuda*, for four different species.

***Coccoloba scandens* Poeppig ex Lindau, Bot. Jahrb. 13: 181. 1890.**

Lindau published this epithet (a manuscript name found in the Vienna herbarium) in the synonymy of *Coccoloba peltata* Schott. He did not discuss the disposition of the name, but merely cited the collection *Poeppig* 2670 from Ega, Amazonas Province, Brazil. The collections of *Coccoloba* in the Vienna herbarium having been destroyed, it seems worthwhile to call attention to another specimen of *Poeppig* 2670 in the Leningrad herbarium. This consists of three detached leaves and a short piece of stem with two very short inflorescence axes, both without flowers. It can be referred to *Coccoloba parimensis* Benth.

***Coccoloba schomburgkii* Meisner, Linnaea 21: 265. 1848.**

Meisner mentioned only *Schomburgk* 640 in the original description, but indicated that several specimens were in the Shuttleworth herbarium. Specimens and fragments of this collection are now widely distributed, and a study of a great many of them suggests a variation within the species in the size of leaves and the length of the inflorescences. Numerous recent collections by Steyermark and by Maguire and his associates are available for study and these indicate that, for the present, a very great variation in the habit of the plant and an apparently associated variation in the size and shape of the leaves must be recognized. It is hoped that some future collector in the table-mountain area will be able to determine the range of variation on one plant.

Coccoloba schomburgkii is variously described on collectors' labels as

"shrub 1 foot tall," "small recumbent shrub," "shrub with simple or spreading stems, 3–5 feet tall," "depressed shrub 4 dm. tall," "tree 5–8 m.," "sprawling ligneous vine" or "liana." All of the specimens cited below were collected between 1100 and 2400 meters above sea level. The smaller specimens are reported from "rocky elevations in savannah," while those described as "trees" or "lianas" are reported from the forested edges of savannas, along rivers or on forested slopes. There is a suggestion of a correlation between habitat and leaf size, the plants of the savanna areas or rocky outcrops having the smaller leaves and those of the forested areas having larger leaves. Meisner stated in the original description that the leaves are 1.5–2.5 inches long and 0.75–2 inches wide and heteromorphic on the same branch. Lindau increased the dimensions to 6–10 cm. long and 3–5 cm. broad. The specimens cited below have, within single collections, leaves of the following dimensions: $1.5 \times .8$ to 4.5×2 cm.; 3.5×2 to 7.5×4.5 ; 4×2.7 to 7×5 ; 8×5 to 13×8 cm. long and broad. The small leaf-measurements are from the small plants with compact branches and short internodes. The largest leaf-sizes were taken from arching shoots with long internodes, described as a liana. All leaves are coriaceous and in most cases the margin is slightly inrolled. The primary veins depart at right angles, bifurcating near the margin, or are arcuate at slight angles from the midrib. Only one collection has fruit and these are immature. *C. schomburgkii* must be recognized as an extremely variable species as far as leaf size and shape is concerned. The length of the inflorescence appears to vary in proportion to the size of the leaf.

Brazil. AMAZONAS: Territory Rio Branco, Serra Sabang, *B. & C. Maguire* 40302 (A, NY), 40433 (A, NY). **British Guiana.** Roraima, *Schomburgk* 640 (981) (K-holotype, B, F, G); Upper Mazaruni river, Imbaimadai Savanna, *Maguire & Fanshawe* 32188 (A, NY); between Chinowieng & Chi-Chi landing, *B. & C. Maguire* 40663 (A, NY). **Venezuela.** BOLIVAR: Ilu-tepui, Gran Sabana, Mesa Ridge, *Maguire* 33402 (A, NY), 33549 (NY); between Enemasic and San Rafael, *Maguire* 33596 (A, NY); N.W. of Kavanayen Mission, *Maguire* 33741 (A, NY); Ptari-tepui, *Maguire & Wurdack* 33900 (A, NY), 33918 (A, NY), *Steyermark* 59678 (F), 59712 (F), 60339 (F), 60618 (F); Mount Roraima, *Steyermark* 58640 (F), 58676 (F).

Coccoloba schwackeana Lindau, Bot. Jahrb. 13: 200. 1890.

Coccoloba erecta Glaziov, Bull. Soc. Bot. Fr. IV. 11 (Mem. 3f): 572. 1911, nomen nudum.

This species is readily recognized by the obovate leaves borne on petioles which are inserted well above the base of the ocreae. I have seen no collections, other than the original, which are in fruit. Lindau cited only *Glaziov* 14219, with specimens in the Berlin and Delessert herbaria. This collection has proved to be a mixture with *Glaziov* 14220 which is *Coccoloba peltata*. *Glaziov* 14219 in the Berlin herbarium is designated as the lectotype.

Brazil. RIO DE JANEIRO: without specific location, *Glaziou 14219* (B-lectotype, C, G, K), *14220* in part (LE, P).

Coccoloba senaei Lindau ex Glaziou, Bull. Soc. Bot. Fr. IV. 11(Mem. 3f): 571. 1911.

This epithet was used by Glaziou in a list of determinations of his collections. The name was not published by Lindau, so far as I can determine. Glaziou's description is brief and of no value in the genus. The name should be considered a *nomen nudum* and the species should be referred to the synonymy of *Coccoloba brasiliensis* Nees & Martius (*q.v.*). *Glaziou 19762* and *19763* from Rio dos Pedras, Valu, Minas Geraes, Brazil, were cited by the collector and a specimen of *Glaziou 19763* in the herbarium at Copenhagen has been labeled the cotype. In the Berlin herbarium *Glaziou 19763* and *Schwacke 8005* are both labeled "*Coccoloba senaei* Lindau, n. sp."

Coccoloba sparsifolia Lindau, Bot. Jahrb. 13: 195. 1890.

Lindau based this species on *Don 144* from the state of Maranhão in Brazil. Only a single specimen is indicated and that is in the herbarium at Brussels, although Lindau acquired a fragment which is currently in the Berlin herbarium. I have seen the holotype, which consists of a stem with several short inflorescences and two detached leaves. These leaves are of thin texture, called membranaceous by Lindau, with slender, short petioles. In all aspects the type suggests young specimens of *Coccoloba ascendens*. Lindau separated *C. sparsifolia* and *C. ascendens* in his key to the species on the basis of the glabrous inflorescence axis in the former and the puberulent axis in the latter. However, the type specimen of *C. sparsifolia* does not support this distinction, for the inflorescence axes are as puberulent as those of *C. ascendens*. While additional material may prove it necessary to assign *C. sparsifolia* to the synonymy of *C. ascendens*, I prefer to maintain them as separate species for the present.

Gleason 349 (GH, NY) from the bank of the Potaro River, Tumatumari, British Guiana, is also referred to *C. sparsifolia*. This has ovate leaves, coriaceous in texture, with short, stout petioles. The secondary venation is impressed in the dried condition and the leaf base is conspicuously cordate. Such a combination of characteristics is not familiar to me from the many collections of *C. ascendens* I have seen and from the plants I have studied in the Antilles.

Coccoloba spec. an nova? Herzog, Rijks Herb. Meded. 46: 3. 1922.

The collection *Herzog 1480* made along the Río Piray near Santa Cruz de la Sierra, Bolivia, is completely sterile. Herzog suggested that it might be a new species. The broadly lanceolate leaves are acute at the apex and narrowed to an obtuse base. The petiole is only 2–4 mm. long.

Tufts of brown hairs occur in the axils of the primary veins along the midrib. The specimens are best assigned to *Coccoloba peruviana* (q.v.), even though that species is poorly defined at the present.

Coccoloba sphaerococca Lindau, Bot. Jahrb. 13: 185. 1890.

This species was considered to be similar to *Coccoloba densifrons* Mart. ex Meisner. Both Lindau in his monograph and Macbride (Flora of Peru, Publ. Field Mus. Bot. 13: 458. 1937) distinguished the two on the basis of venation. The upper leaf surface of *C. sphaerococca* is essentially smooth with the minute venation finely reticulate. The primary veins are not evident. In contrast, the primary venation of *C. densifrons* is evident and when dry the ridged veins are conspicuous by being slightly depressed in the leaf surface.

None of the previous workers has compared this species with *Coccoloba padiformis* Meisner, but while Meisner's species is based on a staminate plant and *C. sphaerococca* is based on a fruiting specimen, it appears to me that only one species is represented. I therefore refer *C. sphaerococca* to the synonymy of *C. padiformis* Meisner. The type is an unnumbered Spruce collection in the Kew Herbarium collected near Tarapoto, Peru.

Coccoloba spinescens Morong, Enum. Pl. 212. 1892; Ann. N.Y. Acad. 7: 212. 1893.

Coccoloba sarmentosa S. Moore, Trans. Linn. Soc. II. 4: 446. 1895.

Coccoloba paraguariensis f. *intermedia* Hassler, Repert. Sp. Nov. 14: 163. 1915.

Coccoloba paraguariensis var. *grandifolia* Hassler, *ibid.*

Coccoloba paraguariensis var. *spinescens* Hassler, *ibid.*

Coccoloba paraguariensis f. *ovatifolia* Herzog, Rijks Herb. Meded. 46: 3. 1922.

Coccoloba chacoensis Standley, Publ. Field Mus. Bot. 17: 239. 1937.

This species is typified by *Morong* 882 of which I have seen several specimens. In the original description Morong noted that the plant was thorny, the thorns consisting of the sharp, indurated ends of the short branches and branchlets. The leaves are described as oval and elliptic and it is important to note that the petioles were described as "downy." An examination of the type material shows also a characteristic rigidity to the leaves which, when dry, have lighter-colored veins and leaf margins. The pedicels recurve strikingly in fruit and the perianth segments enclose the achene.

Hassler incorrectly associated the species with *Coccoloba paraguariensis*, reducing Morong's species to varietal status. As I have pointed out in the discussion of *C. paraguariensis*, that species must be typified by *Balansa* 2060 in the herbarium at Göttingen. The *Balansa* collection is a mixture and only the Göttingen specimen agrees fully with the original description. The material of *Balansa* 2060 in the other herbaria as cited below corres-

ponds with *Morong* 882 and therefore must be called *C. spinescens*. There are definitely two species involved.

Hassler described several varieties and forms of "Coccoloba paraguariensis." The typical *C. spinescens* has the smallest leaves. Hassler's forma *grandifolia* (*Fiebrig* 4237) has the largest. Both leaf sizes can be found in single collections and most variations on single specimens. The varieties and forms are of doubtful value unless further field study proves their validity. Gross has annotated other sheets with unpublished varietal names in the Berlin herbarium and such specimens are included in the citations below.

I have assigned *Coccoloba sarmentosa* Moore to the synonymy of *C. spinescens*. The type of Moore's species (*Moore* 1038) is densely pubescent on the lower leaf surface and the inflorescence. The "downy" petioles mentioned by Morong for *C. spinescens* are typical of the species. However, the pubescence extends along the midrib and onto the lamina, as well. Specimens with the amount and density of pubescence on both leaves and rachises to make them intermediate between the types of *C. sarmentosa* and *C. spinescens* are cited below and indicate that *C. sarmentosa* cannot be maintained as a distinctive species.

Buchinger and Sanchez (*Bol. Soc. Argent. Bot.* 7: 253. 1959) maintain *Coccoloba chacoensis* Standley as a distinct species, separating it from *C. spinescens* in their key by the absence of lateral branches terminating in spines and by the presence of glands on the lower leaf surface. A tendency to produce terminal spines by modification of the shoot apex is seen on many specimens cited below. The presence of "glands" in *Coccoloba* appears to be inconsistent and unreliable. The "glands," in all cases examined, are either blocked stomata or residual hair bases. Glands comparable to those found on the type of *C. chacoensis* are also on material formerly called *C. paraguariensis* f. *ovatifolia* (*Herzog* 1070), *C. paraguariensis* (*Balansa* 2060 in part), *C. paraguariensis* f. *intermedia* (*Hassler* 12327) and *C. paraguariensis* var. *spinescens* (*Rojas* 180).

Bolivia. Chaco, Cururenda, *Cardenas* 2529 (FM-holotype of *C. chacoensis*, G); Gran Chaco, Río Pilcomayo, Camoterías, *Herzog* 1070 (B-type of *C. paraguariensis* f. *ovatifolia*). **Paraguay.** Asuncion, *Morong* 197a (NY); Chaco, Bahía Negra, *Rojas* 13757 (W); Corumba, *Moore* 1038 (type collection of *C. sarmentosa*, B, NY); Gran Chaco, Loma Clavel, *Hassler* 2486 (A, B, NY); Gran Chaco, *Moore* 1049 (NY); Laguna Ypacaray, *Fiebrig* 968 (A, M); Puerto Casado, *Pedersen* 4027 (A, C); between Río Apa & Río Aquidabán-mi, *Fiebrig* 4237 (type collection of *C. paraguariensis* var. *grandifolia*, A, B, GH, M); Río Paraguay, *Balansa* 2060 in part (B, P); Río Pilcomayo, *Morong* 882 (NY-lectotype, US), *Rojas* 180 (B); Ypacaray, *Hassler* 11476 (A, GH, NY), 12327 (type collection of *C. paraguariensis* f. *intermedia*, A, GH, NY).

Coccoloba spruceana Lindau, *Bot. Jahrb.* 13: 162. 1890.

This species was distinguished by Lindau on the basis of its subcoriaceous, subobovate leaves and long ocreae. Since the type collection has only submature leaves, additional collections are necessary to define this species

accurately. No recent collections have been identified with the type collected by Spruce along the Casiquiari in Venezuela. However, the collections cited below are referred to this species. The collection *Maguire, Wurdack and Bunting 36756* was obtained from the classic area of Spruce and was described by the collectors as a tree 8 m. tall. The inflorescences are in bud, yet the leaves appear to be more mature than those of *Spruce 3185*. Considerable variation in leaf size and shape is to be seen on a single branch and the largest leaf can be described as broadly elliptic-oblong with a blade 16 cm. long, 13 cm. broad, rounded at the base and rounded but short-apiculate at the apex. The collections by Ducke, Silverio Level and by Wurdack and Adderley represent still another aspect of the same species. These are all from trees and consist of relatively stout branches of slow growth habit. The leaves, showing considerable variation in size and shape, are well expanded but membranaceous in texture and associated with staminate inflorescences in full flower. It appears that the type collection of Spruce with its obovate leaves represents only one phase of the final concept of this species. The relationship of *Coccoloba spruceana* to *C. striata*, for example, must be re-examined when pistillate flowers and fruiting material are available.

Venezuela. AMAZONAS: rivers Casiquiari, Vasiva and Pacimoni, *Spruce 3185* (GH-lectotype, BR, LE, NY, P); uppermost Río Yatua, *Maguire, Wurdack and Bunting 36756* (A, NY), between Tama-Tama and San Antonio, *Wurdack and Adderley 43652* (A), Cano Yagual on Río Orinoco, *Silverio Level 112* (A). Brazil. AMAZONAS: Manaus, *Ducke 21367* (F, NY, Y).

***Coccoloba squamosa* Martius ex Colla, Herb. Pedemontanum 5: 48. 1836.**

The original description is brief: "7. *C. squamosa* = Mart: in sched: (*Brasil:*) 'C. caule laeviusculo, foliis brevi-petiolatis ellipticis (longit: 1. latit: $\frac{1}{2}$ pollic:), basi inaequilateris membranaceis integerrimis glabris subtus pallidioribus, racemis axillaribus spicatis nutantibus.' NOB:" Neither Meisner nor Lindau considered this name in their treatments of the genus and I have been unable to locate any specimens, by Martius or others, which bear such a name. The only Brazilian species with leaves of comparable size is *Coccoloba pipericarpa* Mart. ex Meisner, but none of the five Martius collections I have seen of this species bears such a manuscript name. For the present *C. squamosa* cannot be identified.

***Coccoloba sticticaulis* Weddell, Ann. Sci. Nat. III. 13: 260. 1849.**

Coccoloba longependula Martius ex Meisn. Fl. Bras. 5(1): 27. pl. 9, 1855.

A comparison of the authentic specimens of these species indicates that they are identical and that *Coccoloba longependula* should be referred to the synonymy of *C. sticticaulis*. When Meisner described *C. longependula* he referred to Weddell's *C. sticticaulis*, but indicated that he had not seen material of the type, *Claussen 280*. Lindau also stressed the occurrence of

2 styles in "*C. longipendula*" (sic) in contrast to three styles in *C. sticticaulis*. Unfortunately, such characters are of no value in this genus. Lindau (Engl. Bot. Jahrb. 13: pl. 5, figs. 34, 37. 1890) illustrated fruits of both species, describing *C. sticticaulis* as having an ovoid, shortly stipitate fruit, in contrast to the fruit of *C. longependula*, which he described as globose. I have examined all of the specimens cited by Lindau, but not from all the herbaria he listed. There are no fruits available for the specimens I have seen; hence I question Lindau's description of the fruit of *C. sticticaulis*. A study of additional and more recently collected material supports the conclusion that only one species is involved.

A name honoring Claussen is also applied to the Claussen collections I have seen, many of which are without numbers. This name attributed to Weddell, apparently was never published.

Lindau (Bot. Jahrb. 13: 184. 1890) placed the name *Coccoloba scandens* Casaretto (q.v.) in the synonymy of *C. sticticaulis* and referred to Meisner's treatments in the *Flora Brasiliensis* and DeCandolle's *Prodromus*. Neither Lindau nor Meisner saw or cited Casaretto's collection. Both authors cited a Riedel collection from Parahyba which I have not seen. Lindau cited *Riedel 2681* and Meisner, *Riedel s.n.* If Lindau is correct in considering *C. scandens* Casaretto identical to *C. sticticaulis* Weddell, then the Casaretto epithet must be used for this species.

Brazil. MINAS GERAES: Bello Horizonte, *L. O. Williams & Assis 6046* (GH); Bento Pires, Bello Horizonte, *L. O. Williams 5285* (GH); Capoeiras, Ouro Preto, *Damazio 1539* (G); Faria, *Glaziov 18427* (A, LE); Lagoa Grande, Município Nova Lima, *L. O. Williams & Assis 6577* (GH); Lagoa Pampulha, Município Bello Horizonte, *L. O. Williams & Assis 6096* (GH); between Porte do Paraopeba & Chapada, *Martius 759* (M-type of *C. longependula*); without specific locality, *Claussen 280* (P-lectotype of *C. sticticaulis*, (G), *s.n.* (A, GH); *Glaziov 21979* (BR). RIO DE JANEIRO: Caxoeira do Campo, *Lund 35* (B); Caxoeira do Campo, Lazona Sta., *Warming 130* (C, LE); Restinga do Jacarépaguá, *Brade 77* (GH); Serra do Piedada, *Warming 126* (NY); Sta. Luzia do Rio das Velhas, *Schwacke 11431* (B).

Coccoloba striata Benth in Hooker, London Jour. Bot. 4: 626. 1845.

Coccoloba grisebachiana Lindau, Bot. Jahrb. 13: 195. 1890.

Coccoloba pittieri R. Knuth ex Pittier, Man. Pl. Usuales Venez. 355. 1926.

Benth based this species on a collection by Schomburgk from British Guiana. Although a specific locality is not given, Lindau thought it to be near Roraima and one herbarium label refers to the "savannah." The collection was made in April, 1843, and bears the second collection numbers 929 or 1265.

Coccoloba grisebachiana Lindau, based on *Crueger s.n.* from Trinidad, and *C. pittieri*, based on *Pittier 8880* from Venezuela, were placed in the synonymy of *C. striata* in an earlier paper (Jour. Arnold Arb. 40: 89. 1959).

The relationships of *Coccoloba glaziovii*, *C. parimensis*, and *C. spruceana*

with the present species are not clear. Additional material and field study may show these to be representatives of only one species.

British Guiana. Roraima area, *Schomburgk* 929 (P), 1265 (B, P). Venezuela. ANZÓATEQUI: El Amparo de Chive, *Pittier* 15025 (US); Guaremalos, Punta Cabello San Felipe, *Pittier* 8880 (type collection of *C. pittieri*, A, GH, LE, NY). FEDERAL DISTRICT: Carruao, *Pittier* 11847 (A, GH, NY).

Coccoloba stricta Klotzsch in Schomburgk, Fl. Faun. Br. Guy. 934. 1848; Lindau, Bot. Jahrb. 13: 167. 1890.

Lindau referred this name, published without description, to the synonymy of *Coccoloba lucidula*. Of the Schomburgk collections I have seen and identified as *C. lucidula*, none has such a manuscript name.

Coccoloba strobilulifera Meisner, Fl. Bras. 5(1): 25. 1885; Howard, Jour. Arnold Arb. 40: 185. 1959; Lindau, Bot. Jahrb. 13: 193. 1890.

Coccoloba strobilulifera was based on *Moritz s.n.* (type-P), collected in Colombia but without a known specific locality.

Meisner recognized that *Coccoloba strobilulifera* was similar to *C. acuminata* HBK., but stressed the differences in pubescence, shape of leaf bases and length of inflorescences in establishing and maintaining the species. Lindau placed the species in the synonymy of *C. acuminata*, but described a new variety to accommodate it. The numerous collections I have cited previously (*loc. cit.*) as *C. acuminata* (*q.v.*) show gradations to indicate that *C. strobilulifera* cannot be maintained as a distinct species or variety.

Coccoloba sublobata Heimerl, Denkschr. Akad. Wiss. Wein. 79: 244. 1908.

This species has been referred to the synonymy of *Coccoloba glaziovii* (*q.v.*) and discussed there. The type was in the collections at Vienna and was lost during World War II. However, a photograph of this specimen is in the collections of the Chicago Natural History Museum and a duplicate specimen bearing the same number but a different unpublished binomial attributed to Heimerl is in the Berlin herbarium. The type collection is *M. Wacket* 12, made in 1902 near Santos, Serra do Cubatão, São Paulo, Brazil.

Coccoloba swartzii Meisner, DC. Prodr. 14: 159. 1856; Howard, Jour. Arnold Arb. 37: 324. 1956.

The type locality of this species is Jamaica. Continuous but slight variations occur in collections made in the Antilles, from Jamaica southward to St. Lucia and Barbados, and in Central America, specifically in British Honduras and Honduras. The species has not been collected in Grenada, Trinidad, or Tobago or in Central America south of Honduras. The following collections from Curaçao, Aruba, and mainland Venezuela

fit into the known range of morphological variation but represent a disjunction of the range of the species. Future field studies of the populations represented by the specimens cited may indicate a hybrid situation or that a subspecific category is desirable.

Aruba: *Boldingh* 6384 (NY). **Bonaire:** *Boldingh* 7051, 7489 (NY). **Curacao:** *Boldingh* 4882, 5070 (NY); *Britton & Shafer* 3082 (NY); *Curran and Haman* 150, 234 (NY); *Realino* 18 (NY). **Venezuela.** PARAGUANÁ: Cerro Santa Ana, *Curran & Haman* 525, 539 (GH), 702 (GH, NY); Pueblo Nuevo, *Tamayo* 930 (GH).

Coccoloba tenuiflora Lindau, Bot. Jahrb. 13: 190. 1890.

Lindau described this species and mentioned that he saw a specimen in the Leningrad herbarium. He noted that the specimen was in flower in April, that it had been collected in Brazil, and that neither the specific location nor the name of the collector was indicated. In the material on loan from Leningrad I find a single sheet bearing the name "*C. tenuiflora* Lindau." The three fragments on this sheet are from the Fischer herbarium and one of the three labels on the sheet suggests that the plant may be cultivated. Nearly all of the material of the genus which I have seen from the Fischer herbarium has been of cultivated plants. Although several words cannot be deciphered, no date is given on any of the labels. There is also a second sheet in the Leningrad herbarium which was not annotated by Lindau but which is clearly the same plant. The label on this sheet states that the specimen is from a cultivated plant. The typification of this species is difficult. Lindau apparently obtained a fragment from the Leningrad sheet which he cited and the fragment plus a drawing is in the Berlin herbarium, though this was not cited in the original description. The sheet in Leningrad which Lindau cited has several fragments, plus additional material in packets; these could have come from one plant or from several or could have been taken at different times. However, it appears necessary to designate the sheet in Leningrad as the holotype.

Coccoloba tenuiflora Lindau is poorly understood. The species appears to be similar to *C. longipes* from the Matto Grosso, but the effects of greenhouse cultivation on *C. tenuiflora* are difficult to evaluate. The plants are obviously deciduous in cultivation, for some specimens show a flush of immature and delicate membranaceous leaves and ocreae on elongated shoots. Lindau concluded that the oblong to obovate leaves with long, acuminate apices and the elongated pedicels distinguish the species.

Coccoloba tiliacea Lindau, Bot. Jahrb. 13: 198. 1890; Buchinger & Sanchez, Bol. Soc. Argent. Bot. 7: 255. 1959.

Coccoloba peltata Griseb. Symb. Fl. Argent. 508. 1879, not Schott.

This species is easily recognized and is well represented in herbaria by material from northeastern Argentina and Bolivia. The plants are small trees with broadly ovate leaves which are commonly crenate or undulate

at the margins. The leaves vary from peltate to non-peltate on the same specimens. The base of the blade may be obtuse and slightly to deeply cordate. The blades may show all gradations from attachment at the margin to peltation, with as much as 2.5 cm. of lamina between the petiole point of attachment and the margin. The inflorescence may be simple or much branched. The inflorescence branches usually arise from the base and may give the appearance of a cluster of racemes of equal length. The fruit has imbricate, but non-coronate perianth lobes one-third the length of the fruit.

In the original description Lindau cited several specimens without indicating a type. *Lorentz & Hieronymus* 499 (B) has been designated as the lectotype.

Argentina. JUJUY: Ledesma, Sierra de Calilegua, *Venturi* 5355 (A, F, GH); San Pedro, Sierra Santa Bárbara, *Venturi* 9655 (A, GH, LE, NY); San Antonio near San Lorenzo, *Lorentz & Hieronymus* 378 (B, GOET), *Schulz* 8169 (B, NY). SALTA: Orán, Badahonda, *Lorentz & Hieronymus* 446 (GOET, NY, S), 499 (B-lectotype, GOET), Cuesta de Santa Rosa, *Lorentz & Hieronymus* 658 (B, NY), El Bananal, *Meyer* 658 (B, NY), Quinta del Río Santa María, *Willink* 127 (W), Río Bermejo, *Schreiter* 218 (F), Río Colorado, Paso Hondo, *Meyer* 6492 (W), Tartagal, *Schreiter* 3696 (GH), 8462 (GH), 11471 (A), *Venturi* 5176 (A), Vado Hondo, *Devoto & Alberti* 2223 (A). TUCUMÁN: Capital, cultivated, *Meyer* 15813 (BR, W). **Bolivia.** LA PAZ: Sierra de Aguaragra, *Troll* 304 (B). SANTA CRUZ: Between Santa Cruz and Samaipata, *Cardenas* 4631 (US). TARIJA: La Merced, near Bermejo, *Fiebrig* 2178 (A, M).

***Coccoloba trianaei* Lindau, Bot. Jahrb. 13: 213. 1890.**

This species is known only from the type collection, *Triana* 974, with the holotype in the Berlin herbarium and one isotype at Brussels. The collection was made in Colombia but no specific location or altitude data are given. The specimens are from staminate plants and the inflorescence tends to produce several shorter branches from near the base.

Coccoloba trianaei is similar to both *C. lehmannii* and *C. venosa*. It differs from *C. lehmannii* in having more lanceolate to ovate-lanceolate leaves with abruptly rounded bases and much shorter petioles. The stems, leaves and inflorescences are slightly more pubescent than in comparable material of *C. lehmannii*. In size and shape, the leaves of *C. trianaei* are similar to many specimens of *C. venosa*; however, the amount of pubescence and the laxly flowered inflorescence differs from that of *C. venosa*. Additional collections of *Coccoloba* are needed from coastal areas of Colombia to determine whether *C. trianaei* is only a pubescent phase of *C. venosa* or a truly distinct species.

***Coccoloba uvifera* (Linnaeus) Linnaeus, Syst. Nat. ed. 10. 1007. 1759.**

Polygonum uvifera L. Sp. Pl. 365. 1753.

The common "sea grape" or "uva" is a well-known tropical American tree of the seacoast areas. It is abundant in the Caribbean, yet it has been

overlooked there by many collectors so that herbarium records of its distribution show many gaps where it might be expected to occur.

In the present study it is of interest to note that the species is not represented in collections from Brazil or southern South America. Meisner mentioned the species in his treatment for *Flora Brasiliensis* (5(1): 42. 1855) without seeing specimens and questioned the identification of specimens to that species cited by other authors.

Colombia. ANTIOQUIA: Medellín, *Daniels s.n.* (NY). ATLÁNTICO: Puerto Colombia, *Barkley & Gutiérrez 1859* (F). BOLÍVAR: Boca Grande near Cartagena, *Killip & Smith 14092* (A, GH, NY); Torrecilla near Turbaco, *Killip & Smith 14418* (A, GH, NY). MAGDALENA: Barranquilla, *Holton s.n.* (NY); Santa Marta, *H. H. Smith 2102* (A, NY). Department not indicated: Gaira, *Castañeda 54* (F). Curaçao. *Curran & Haman 53* (A). **Dutch Guiana.** Without location, *Weigelt s.n.* (LE); *Regel 984* (NY). **Venezuela.** FALCÓN: Cumarebo, *Curran & Haman 491* (GH, NY), *492* (GH). FEDERAL DISTRICT: Caracas, *Pittier 10343* (GH, NY); La Guaira, *Fendler 840* (GH, NY); Macuto, *Pittier 11791* (A, NY). SUCRE: Cristóbal Colón, *Broadway 594* (GH, NY). Without location: *Mocquerys 800* (A, NY, P).

Coccoloba uvifera Salzman ex Lindau, Bot. Jahrb. 13: 186. 1890, not Linnaeus.

This epithet is a manuscript name on several Salzman collections, although Lindau referred specifically to the one in the Delessert herbarium. Lindau appears to have been the first to publish the name in the synonymy of *Coccoloba laevis* Casaretto. I have discussed the Salzman collections under *C. laevis*.

Coccoloba vellosiana Casaretto, Nov. Stirp. Bras. 70. 1844; Howard, Jour. Arnold Arb. 41: 43. 1960.

In an earlier study (*loc. cit.*) I placed this epithet in the synonymy of *Coccoloba arborescens* (q.v.). Although Casaretto cited an unnumbered Riedel collection in the original description, he also indicated that his new species was a transfer of *Polygonum frutescens* Vellozo. *Coccoloba vellosiana*, therefore, must also be rejected as an illegitimate name.

Coccoloba venosa Linnaeus, Syst. Nat. ed. 10. 1007. 1759.

The complexities of this name, along with the problems of the morphology and distribution of the species, have been discussed by Fawcett and Rendle (Jour. Bot. 51: 123. 1913) and by me (Jour. Arnold Arb. 30: 398. 1949; 40: 217. 1959). The specimens cited below are typical of the Lesser Antillean expression of the species, with the sole exception of *Velez 2668* which is similar to material from Central America formerly called *Coccoloba floribunda*.

Colombia. META: Puerto López, *E. L. & R. R. Little 8416* (NY). **Venezuela.** APURE: Puerto Páez, *Velez 2668* (US). SUCRE: Cristóbal Colón, *Broadway 431* (GH), *664* (GH, NY). YARACUY: Aroa, *Curran 323* (NY).

Coccoloba virens Lindley, Bot. Reg. 21: *pl.* 1816. 1835; Howard, Jour. Arnold Arb. 41: 41. 1960.

This species was based on greenhouse material of unknown origin presumed to be from the West Indies. As I have pointed out, Lindau placed the species incorrectly. The correct disposition is to regard *Coccoloba virens* as a synonym of *C. coronata* Jacq.

Coccoloba warmingii Meisner in Warming, Symbolae 128. 1870.

Coccoloba rubra L. B. Smith, Jour. Wash. Acad. Sci. 45: 197, *figs.* 1-4. 1955.

This species of southeastern Brazil is recognized by the obovate leaves which are bullate between the veins. The leaf apex is rounded, emarginate or abruptly mucronate in immature leaves but all mature leaves showed abnormal development of the apex.

No specimens are cited by number in the original description where Meisner stated, "Hab. in Serra da Gamba et in prov. Rio de Janeiro, m. Maio legit Warming." Lindau (Bot. Jahrb. 13: 200. 1890) cited only specimens in the Warming herbarium but referred to these by numbers 125 and 128. There is a fragment of an inflorescence, a single detached leaf and a sketch of an attached leaf of *Warming* 125 in the Berlin herbarium. The origin of this fragment is not given. Specimens of both *Warming* 125 and 128 are to be found in the Copenhagen herbarium where the first sheet is labelled "co type" and its origin indicated as "Rio." *Warming* 128 (collected at Serra da Gamba) in the Copenhagen herbarium should be the lectotype.

Smith suggested that his new species *Coccoloba rubra* would be near to *C. schwackeana* in Lindau's key to the genus. Lindau's key, however, is faulty and it is difficult to reach *C. warmingii* with the material Lindau preserved in the Berlin herbarium. It is clear that *C. rubra* is a synonym of *C. warmingii*.

A single sterile specimen of *Burchell* 3982 in the Kew herbarium appears to represent the adventitious leaf form of this species. Although Lindau referred this collection to *Coccoloba latifolia*, the elevated origin of the petiole on the ocrea indicates that the collection is better assigned here. *Dusen* 17225 cited below is a similar sterile collection.

Brazil. MINAS GERAES: Piedade a Santa Luzia, *Glaziou* 20438 (B, LE, P); Santa Luzia do Rio das Velhas, *Schwacke* 11430 (P). RIO DE JANEIRO: Rio de Janeiro, *Warming* 125 (B, C); Serra da Gamba, *Warming* 128 (c-lectotype, B). SANTA CATARINA: Mato do Hoffmann, Brusque, *Klein s.n.* (Instituto de Malariologia 33) (US-type of *C. rubra*). SÃO PAULO: Jacarehy, *Dusen* 17225 (GH).

Coccoloba williamsii Standley, Publ. Field Mus. Bot. 11: 148. 1936.

The type of this species in the Chicago Natural History Museum is *Llewelyn Williams* 4803 from Peru. I have referred this species to the synonymy of *Coccoloba lehmannii* Lindau in an earlier paper (Jour. Arnold Arb. 40: 200. 1959).

Coccoloba zernyi Standley, Publ. Field Mus. Bot. 22: 18. 1940.

The type and apparently the only specimen of this species was collected by Ginzberger and Zerny between Taperinha and Santarem in Amazonas, Brazil, Aug. 13, 1927. It consists of two flowering branches and a few detached leaves in a packet. The inflorescence is very pubescent and all the flowers examined were staminate, lacking even the rudiments of a pistil. There is little doubt that this species is more properly assigned to the genus *Ruprechtia*; * however, the material available is inadequate for reference to any known species. It is hoped that some future monographer of *Ruprechtia* may find the correct assignment for this specimen.

* *Ruprechtia zernyi* (Standley) Howard, comb. nov. *Coccoloba zernyi* Standley, Publ. Field Mus. Bot. 22: 18. 1940.